

## EE5324 STATISTICAL INFERENCE FOR SIGNAL ANALYSIS SYLLABUS

<i>Classroom</i>	TBA
<i>Meeting Time</i>	MW 9:00 – 10:20 AM
<i>Instructor</i>	Dr. Benjamin C. Flores Forrest H. and Henrietta Lewis Professor of Electrical Engineering
<i>Office</i>	Engineering Building, Room A336
<i>Office Hours</i>	by appointment (request a virtual appointment by e-mail at least a day in advance)
<i>Textbook</i>	Multiple references are available at the library in the reserved books section.
<i>Notes</i>	available on Blackboard
<i>Other</i>	scientific/graphics calculator, laptop, MATLAB

### COURSE DESCRIPTION

Graduate-level introduction to the principles of statistical inference (*educated guess*) using probabilistic models in signal and information processing.

### MAIN TOPICS

1. Probability and Stochastic (i.e. Random, Time-Dependent) Processes
2. Binary Hypothesis Testing
3. Detection of Known Signals
4. Detection of Signals with Random Parameters
5. Parameter Estimation
6. Kalman Filtering (Linear Quadratic Estimator)

### LEARNING OUTCOMES (Bloom's Taxonomy – Analysis and Synthesis Levels)

By the end of the semester, you will be able to:

1. Analyze and simulate stochastic processes and draw conclusions
2. Apply different criteria for binary hypothesis testing and do a comparative analysis
3. Apply detection techniques for known signals in white noise and draw conclusions
4. Apply detection techniques for signals with random parameters and draw conclusions
5. Apply estimation techniques for specific parameters in the presence of white noise and draw conclusions
6. Implement a Kalman filter for trajectory estimation and draw conclusions

### EXPECTATIONS

1. Maintain academic integrity standards at all times. Cases of alleged academic dishonesty (presenting someone else's work as own, collusion, etc.) will be reported to the Dean of Students (OSCCR) and may result in course failure, suspension, or expulsion.
2. Be on time.
3. Take notes in class and maintain a course binder. (You learn by doing: listening, observing, and writing are all good for the brain.)

4. Participate in class.
5. Take quizzes online before the due date.
6. Turn in project reports on time.

### **MATLAB**

Working knowledge of MATLAB is necessary for this course. Tutoring videos are available on the MathWorks website, <https://www.mathworks.com/>.

### **FINAL GRADE**

The final grade is based on three MATLAB projects (hypothesis testing, signal detection, parameter estimation) and biweekly quizzes. You may take a quiz up to three times before its deadline. Only the highest grade will be considered for average calculations. You may upload a report three times prior to the deadline. Only the latest report will be graded. If the report is below par, you may receive feedback on your project report and be asked to resubmit it once. The final score will be calculated as follows:

$$\text{Final score (\%)} = \frac{1}{2} \text{ report average} + \frac{1}{2} \text{ quiz average}$$

Lack of engagement or unexcused absences may result in an administrative drop.

### **SPECIAL ACCOMMODATIONS**

Students who require special accommodations are encouraged to visit UTEP's Center for Accommodations and Student Services (CASS) and report to their instructor at the beginning of the semester. All services are strictly confidential.

### **COUNSELING**

Students who feel the need for mental health support are encouraged to visit UTEP's Counseling and Psychological Services (CAPS) Office. All services are strictly confidential.

### **HEALTH**

Students in need of primary care services, immunizations, wellness, and nutrition education are encouraged to visit UTEP's Student Health and Wellness Center. All services are strictly confidential.

This syllabus may be modified by the instructor during the semester.

*Prepared by Dr. Benjamin C. Flores, January 2023*